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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/781,780	02/20/2004	Kete Charles Chalermkraivuth	52493.000352	4471
21967 7590 08/23/2007 HUNTON & WILLIAMS LLP INTELLECTUAL PROPERTY DEPARTMENT 1900 K STREET, N.W. SUITE 1200 WASHINGTON, DC 20006-1109			EXAMINER BASIT, ABDUL	
			ART UNIT 3694	PAPER NUMBER
			MAIL DATE 08/23/2007	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/781,780	CHALERMKRAIVUTH ET AL.	
	Examiner	Art Unit	
	Abdul Basit	3694	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>2/20/2004</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-6, 12-13, and 21-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Masch (US Pat. No. 5,930,762).

Regarding claim 1:

Masch teaches a method for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the method comprising:

- Generating an initial population of solutions of portfolio allocations; (*see column 2, lines 32-65*).
- Performing a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier; (*see column 42, 44, and 15 generally*).
- Performing a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; (*see column 42, 44, and 15 generally*) and

- Fusing the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier for use in investment decision making.

(see column 42, 44, and 15 generally).

Regarding claim 2:

Masch teaches that the method of claim 1, wherein the first multi-objective process and the second multi-objective process are the same process. *(see column 15 generally).*

Regarding claim 3:

Masch teaches that the method of claim 1, wherein the first multi-objective process and the second multi-objective process are a different process. *(see column 15 generally).*

Regarding claim 4:

Masch teaches that the method of claim 1, wherein the portfolio allocations are allocations of securities. *(see column 2, lines 32-65).*

Regarding claim 5:

Masch teaches that the method of claim 1, wherein the fusing of the first interim efficient frontier and the second interim efficient frontier is performed using a concatenation process. *(see column 15 generally).*

Regarding claim 6:

Masch teaches that the method of claim 1, wherein the competing objectives are risk and return measures. *(see column 15 generally).*

Regarding claim 12:

Masch teaches that the method of claim 1, wherein generating the initial population includes generating an initial population of feasible solutions. *(see column 15*

generally).

Regarding claim 13:

Masch teaches that the method of claim 1, the method further including selecting at least one portfolio from the generated efficient frontier in a multi-objective decision making environment to meet investment goals. *(see column 15 generally).*

Regarding claim 21:

Masch teaches that the method of claim 1, further comprising applying a dominance process to the augmented efficient frontier to create a global efficient frontier. *(see column 10, lines 14-25).*

Regarding claim 22:

Masch teaches that the system for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the system comprising:

- A population generation portion that generates an initial population of solutions of portfolio allocations; *(see column 15 generally).*
- A first processing portion that performs a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier; *(see column 15 generally).*
- A second processing portion that performs a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; and *(see column 15 generally).*

Art Unit: 3694

- A fusion portion that fuses the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier for use in investment decision making. *(see column 15 generally)*.

Regarding claim 23:

Masch teaches that the system of claim 22, wherein the first multi-objective process and the second multi-objective process are a different process. *(see column 15 generally)*.

Regarding claim 24:

Masch teaches that the system of claim 22, wherein the fusing of the first interim efficient frontier and the second interim efficient frontier is performed using a concatenation process. *(see column 15 generally)*.

Regarding claim 25:

Masch teaches that the system of claim 22, further including a dominance filtering portion, the dominance filtering portion performing a dominance filtering process in conjunction with the generating of the first interim efficient frontiers. *(see column 15 generally)*.

Regarding claim 26:

Masch teaches that the computer readable medium for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the computer readable medium comprising:

- A first portion that generates an initial population of solutions of portfolio allocations; *(see column 15 generally)*.

- A second portion that performs a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier; (*see column 15 generally*).
- A third portion that performs a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; and (*see column 15 generally*)
- A fourth portion that fuses the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier for use in investment decision making. (*see column 15 generally*).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 7-8 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masch in view of H.A. Abbas' article PDE: A Pareto-frontier differential evolution approach for multi-objective optimization problems (Proceedings of the 2001 Congress on Evolutionary Computation, IEEE).

Regarding claim 7:

Abbas, not Masch, teaches that the method of claim 1, wherein the first multi-objective process is a Pareto Sorting Evolutionary Algorithm (PSEA) process. (see page 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Abbas. Motivation to modify exists because a PSEA process outperforms other state of the art evolutionary algorithms for solving MOPs.

Regarding claim 8:

Abbas, not Masch, teaches that the method method of claim 7, further including using a dominance filtering process in the generating of the first interim efficient frontiers. (see page 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Abbas. Motivation to modify exists because a PSEA process outperforms other state of the art evolutionary algorithms for solving MOPs.

Regarding claim 27:

Masch teaches that the method for multi-objective portfolio optimization for use in investment decisions based on competing objectives and a plurality of constraints constituting a portfolio problem, the method comprising:

- Generating an initial population of solutions of portfolio allocations; (*see column 15 and 42 generally*).
- Performing a first multi-objective process, based on the initial population and the competing objectives, to generate a first interim efficient frontier; (*see column 15 and 42 generally*).
- Performing a second multi-objective process, based on the initial population and the competing objectives, to generate a second interim efficient frontier; (*see column 15 and 42 generally*) and

- Fusing the first interim efficient frontier with the second interim efficient frontier to create an augmented efficient frontier for use in investment decision making; *(see column 15 and 42 generally)*.
- Wherein the first multi-objective process and the second multi-objective process are a different process; *(see column 15 and 42 generally)*.
- Wherein the competing objectives are risk and return measures; *(see column 15 and 42 generally)*.

Abbas, not Masch, teaches that a first multi-objective process is a Pareto Sorting Evolutionary Algorithm (PSEA) process, and the method further including using a dominance filtering process in the generating of the first interim efficient frontiers. *(see page 1)*.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Abbas. Motivation to modify exists because a PSEA process outperforms other state of the art evolutionary algorithms for solving MOPs.

5. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masch in view of Neil Eklund's article, Multiobjective visible spectrum optimization: A genetic algorithm approach (Rensselaer Polytechnic Institute, Volume 6311B)

Regarding claim 9:

Eklund, not Masch, teaches that the method of claim 1, wherein the first multi-objective process is a Target Objectives Genetic Algorithm (TOGA) process. *(see page 1)*.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Eklund. Motivation to modify exists because TOGA provides a

quick calculation of multiple optimal points.

Regarding claim 10:

Eklund, not Masch, teaches that the method of claim 9, further including using a dominance filtering process in the generating of the first interim efficient frontiers. (see page 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Eklund. Motivation to modify exists because TOGA provides a quick calculation of multiple optimal points.

6. Claims 11, 19 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masch in view of Abu Masud's article, Interactive Sequential Goal Programming (The Journal of the Operational Research Society, Vol. 32, No. 5, May 1981).

Regarding claim 11:

Masud, not Masch, teaches that the method of claim 1, wherein the first multi-objective process is a sequential linear programming process. (see page 391-392)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Masud. Motivation to modify exists because this prevents nondominance of solutions.

Regarding claim 19:

Masud, not Masch, teaches that the method of claim 1, wherein the generating an initial population of solutions of portfolio allocations includes a process for systematically generating the initial population of solutions to substantially cover an entire risk/return objectives space. (see page 391-392)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Masud. Motivation to modify exists because this prevents nondominance of solutions.

Regarding claim 20:

Masud, not Masch, teaches that the method of claim 19, wherein the generating the initial population of solutions uses combination of linear programming and sequential linear programming algorithms. (see page 391-392)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Masud. Motivation to modify exists because this prevents nondominance of solutions.

7. Claims 14, 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masch in view of Bellmore's article, Generalized Penalty-Function concepts in mathematical optimization (Operational Research, Vol. 18, No. 2, March/April 1970).

Regarding claim 14:

Bellmore, not Masch, teaches that the method of claim 13, the selecting at least one portfolio from the generated efficient frontier includes:

- Observing the generated efficient frontier; identifying an area of the efficient frontier in which there is a gap;
- Effecting a gap filling process by which the efficient frontier is filled in the area of the gap.

Art Unit: 3694

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Bellmore. Motivation to modify exists because this provides for a more efficient frontier.

Regarding claim 16:

Masch further teaches that the method of claim 14, wherein the efficient frontier is presented to a human observer in the form of a graphical representation. (see column 16, lines 36-40).

Regarding claim 17:

Masch further teaches that the method of claim 14, wherein the selecting at least one portfolio from the generated efficient frontier includes selecting the at least one portfolio in the from the area that was filled in by the gap filling process. (see column 15 and 42 generally).

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masch in view of Bellmore and in further view of Eklund.

Regarding claim 15:

Eklund, not Masch or Bellmore, teaches that the method of claim 14, wherein the gap filling process is performed using a Target Objectives Genetic Algorithm process. (see page 1).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Masch with Eklund. Motivation to modify exists because TOGA provides a quick calculation of multiple optimal points.

8. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masch in view of Bellmore and in further view of Iwamura's article Chance Constrained Integer Programming Models for Capital Budgeting in Fuzzy Environments (The Journal of the Operational Research Society, August 1998).

Regarding claim 18:

Iwamura teaches:

- Providing a set of target vectors; generating a series of chromosomes over multiple generations; (see pages 852-858) and
- Evaluating the fitness of each chromosome until a population with an acceptable fitness is determined so as to fill in the identified gap. (see pages 852-858)

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Iwamura with Masch and Bellmore. Motivation to modify exists because this allows for a global optimal solution. (see page 857).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abdul Basit whose telephone number is 571 272-7246. The examiner can normally be reached on Monday - Friday, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Trammell can be reached on 571 272 6712. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3694

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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